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Excerpts From Academy's Report on Science Exchanges and U.S. Security

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WASHINGTON, Sept. 30 — Following are excerpts from the executive summary of "Scientific Communication and National Security," a report by a panel of the National Academy of Sciences:

The economic and military strength of the United States is based to a substantial degree on its superior achievements in science and technology and on its capacity to translate those achievements into national defense. There are concerns, however, that the Soviet Union has gained militarily from access to the results of U.S. scientific and technological efforts. Accordingly, there have been recent suggestions that tighter controls should be established on the transfer of information through open channels to the Soviets. Such controls would, however, also inhibit the free communication of scientific and technical information essential to our achievements. The Panel on Scientific Communication and National Security was asked to examine the various aspects of the application of controls to scientific communication and to suggest how to balance competing national objectives so as to best serve the general welfare. This task has involved a careful assessment of the sources of leakage, the nature of universities and scientific communication, the current systems of information control, and the several costs and benefits of controls. These assessments underlie the panel's recommendations.

Unwanted Transfers

There has been a substantial transfer of U.S. technology — much of it directly relevant to military systems — to the Soviet Union from diverse sources. The Soviet science and technology intelligence effort has increased in recent years, including that directed at U.S. universities and scientific research. The Soviet Union is exploiting U.S.-U.S.S.R. exchange programs by giving intelligence assignments to some of its participating nationals. This has led to reports of abuses in which the activities of some Soviet bloc exchange visitors have clearly extended beyond their agreed fields of study and have included activities that are inappropriate for visiting scholars.

There is a strong consensus, however, that universities and open scientific communication have been the source of very little of this technology transfer problems. Although there is a net flow of scientific information from the United States to the Soviet Union, consistent with the generally more advanced status of U.S. science, there is serious doubt as to whether the Soviets can reap significant direct military benefits from this flow in the near term. Moreover, U.S. openness gives this nation access to Soviet science in many key areas, and scientific contacts yield useful insights into Soviet institutions and society.

The principal mission of universities is education; in many American universities research has also become a major activity, but this research is intertwined with teaching and with the training of advanced research scientists and engineers. Participation in research teaches students to solve difficult, novel problems, often under the guidance of first-rate scientists. Federal policies in support of science have reinforced universities' dual functions.

The system as it has recently evolved has been remarkably successful; American research universities attract some of the best minds from around the world and are the principal source of our scientific preeminence. The effectiveness of this research is now seriously threatened, however, by a number of economic and social forces.

Restrictions on Communication

Scientific communication is traditionally open and international in character. Scientific advance depends on worldwide access to all the prior findings in a field — and, often, in seemingly unrelated fields — and on systematic critical review of findings by the world scientific community. In addition to open international publication, there are many informal types of essential scientific communication, including circulation of prepublication drafts, discussions at scientific meetings, special seminars and personal communications.

The Government can restrict scientific communication in various ways. First, information bearing a particularly close relationship to national security may be subject to classification. This is the most stringent of the control systems because it serves to bar all unauthorized access.

Second, communications with foreign nationals may be restricted by export controls, such as those established by the Export Administration Act (EAA) and its associated Export Administration Regulations (EAR) and by the Arms Export Control Act and its associated International Traffic in Arms Regulations (ITAR). Unless an exemption (or "general license") applies, both systems require prior governmental approval for transfer of technical data — either in written or oral communication — to foreign nationals. Neither EAR or ITAR is aimed at general scientific communication, and the Constitution limits the Government's ability to restrain such communication. Nonetheless, some of the current discussion has focused on the application of export controls to scientific communication. This has proved particularly troubling to the research community in that the current control system appears to be vague in its reach, potentially disruptive, and hard to understand.

Third, the Government can include controls on communications in the legal instrument defining the obligations of a recipient of Government research funds. A proposal currently under consideration by the Department of Defense would require a DOD funding recipient to allow the Government the opportunity for prepublication review of manuscripts dealing with certain research areas of national security concern.

Fourth, the Government could attempt to influence conduct by seeking a voluntary agreement with researchers to limit the flow of technical information. Such an agreement is in place to enable the National Security Agency to review manuscripts dealing with cryptography and to negotiate alterations before publication.

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Costs and Benefits

Finally, communication with foreign nationals might be inhibited indirectly by limiting their access to the United States. The Government can deny a visa request or impose restrictions on activities in this country. In addition, the Government can directly regulate the admission of Soviet and East European visitors under particular scientific exchange agreements.

- Controls on scientific communications can be considered in the light of several national objectives. Controls

can be seen to strengthen national security by preventing the use of American results to advance Soviet military strength. But they can also be seen to weaken both military and economic capacities by restricting the mutually beneficial interaction of scientific investigators, inhibiting the flow of research results into military and civilian technology, and lessening the capacity of universities to train advanced researchers. Finally, the imposition of such controls may well erode important educational and cultural values.

With respect to controls and Soviet military gains, the panel notes that while over all a serious technology transfer problem exists, leakage from the research community has not represented a material danger relative to that from other sources. However, some university scientists will continue to expand their research beyond basic scientific investigations into the application of science to technologies with military relevance. This raises the possibility that the university campus will come to be viewed as a place providing much better opportunities for the illegal acquisition of technology. Information that is of special concern is the "know-how" that is gained by extended participation in U.S. research projects.

With respect to U.S. military and

economic progress, controls may slow the rate of scientific advance and thus reduce the rate of technological innovation. Controls also impose economic costs for U.S. high-technology firms, which affect both their prices and their market share in international commerce. Controls may also limit university research and teaching in important areas of technology. The projected shortage of science and engineering talent can become the pacing factor in U.S. technological advance, so maintaining the flow of talented young people to military and commercial technology development efforts is particularly important. A national policy of security by accomplishment has much to recommend it over a policy of security by secrecy.

Apart from these considerations, the U.S. political system and culture are based on the principle of openness. Democracy demands an informed public, and this includes information on science and technology.

The panel has concentrated on the U.S.-U.S.S.R. relationship. However, there are clear problems in scientific communication and national security involving Third World countries. These problems in time might overshadow the Soviet dimension. This entire range of issues is both complex and important, and further intensive study is clearly indicated.